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SEMINAR OF THE LABORATORY FOR DEVELOPMENT OF SCIENTIFIC PROBLEMS
 OF WIRE COMMUNICATIONS, ACADEMY OF SCIENCES USSR

A. D. Kharkevich

Since 1948 a seminar on wire communications, directed by V. I. Kovalenkov, Corresponding Member, Academy of Sciences USSR, has been held in the Laboratory for the Development of Scientific Problems of Wire Communications [hereafter referred to as the laboratory]. Participating were members of the laboratory and workers of the following branch scientific-research institutions and higher educational institutions: Central Scientific Research Institute of Communications (TsNIIS); Moscow Electrical Engineering Institute of Communications (MEIS); Scientific Research Institute of the Cable Industry (NIKP); Central Scientific Research Railroad Institute, Ministry of Transportation (TsNII MPS); and the Central Scientific Research Electrical Engineering Laboratory, Ministry of Electric Power Stations (TsNIEE MES). An account of the seminar's activity in 1952 follows:

The laboratory has been working on the subject "Method of Analyzing the Parameters of High-Voltage Transmission Lines in Regard to Use of the Latter for High-Frequency Telephone Communications." Sessions of the seminar heard two reports by V. A. Sudakov: (1) "Use of the Green Function to Solve the Problem of the Electromagnetic Field of a Conductor with Consideration for the Earth's Field"; and (2) "Determination of the Parameters of the Phase-Ground Circuit with Consideration for Soil Conductivity." Sudakov summarized the method which he developed for analyzing losses in a "one-conductor -- plane earth" line, gave calculations of losses in such a system and results of a comparison with losses in a coaxial line whose return conductor has earth conductivity and a radius equal to the height of conductor suspension; he also gave results of a comparison with losses in a two-conductor line, the return conductor of which is a cylinder having earth conductivity with a radius equal to the height of suspension, while the distance between the direct and return conductors is equal to twice the height of suspension.

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Another session of the seminar on the same subject also heard the following reports: "Determination of the Parameters of a Three-Phase Transmission Line for High-Frequency Telegraphy" by V. I. Kovalenkov, and "Results of Some Measurements on Power Transmission Lines" by Ya. L. Bykhovskiy (TsNIEI MES).

The seminar spent some time on subjects of real importance related to the development of wire communications. For example, V. M. Shteyn submitted a report on "Measurement of the Reflection Spectra of Coaxial Cable Construction Lengths." Shteyn criticized existing methods for measurement of irregularities in the characteristic impedance of construction lengths of coaxial cable, proved the feasibility of measuring the energy spectra of reflection of construction lengths, and set forth the principle of operation of the equipment developed in the laboratory for making these measurements.

In his report "The Effect of Local Nonhomogeneities on the Nature of the Incident and Reflected Waves," V. N. Kuznetsov cited the results of his theoretical study of the transmission of a sinusoidal electromagnetic wave through a constriction of the outer conductor in a coaxial pair. I. V. Koptev (MEIS) submitted a report on this subject, i.e., "Interference Between Coaxial Pairs" as did V. A. Sudakov. The latter report was entitled: "Interference of Coaxial Pairs Located in the Same Lead Sheath."

A number of sessions of the seminar were devoted to the subject "Automation of Telegraph Communications on the Basis of Facsimile Methods." In G. V. Dobrovolskiy's report, "Development of a Method for Determining Speed and Quality of Facsimile Transmissions," the author considered methods for accelerating the steady-state processes occurring in the transmission of impulses and the corresponding increase in transmission speed and also other methods for increasing transmission speed. He also discussed methods for evaluating the quality of the pictures. The principles proposed will substantially increase the speed of facsimile transmission. G. I. Tsemel' submitted a report on "Cutting Down the Rise Time of the Wave Front of Facsimile Signals Through the Use of Circuits with Nonlinear Elements." Dobrovolskiy also submitted a report on "Norming of the Amplitude-Phase Characteristics of Facsimile Channels." He cited the results of work done by the laboratory jointly with the TsNIIS which will be used to establish norms for amplitude and phase distortions in a facsimile channel.

The participants discussed a paper by I. T. Turbovich "The Theory of Errors in Determining the Frequency Characteristic of Residual Attenuation of a Cable Having Irregularities with the Help of an FM Generator."

Research on the subject "Automation of Telephone Communications" was discussed at sessions of the seminar. In his report "Development of a Principle for a Multi-Frequency Selector Control System," V. N. Roginskiy set forth the essentials of a principle which he proposed for control of selectors for automation of interurban and city telephone communications. His idea was illustrated by circuits and calculations made in the laboratory. A number of considerations which favored the use of this principle were brought out in discussions of this proposal. Roginskiy's second report, "Synthesis of Relay Counting Circuits," was given to the problem of applying the theory of relay-contact circuits for the solution of some problems in automatic telephony. A. D. Kharkevich reported on "The Analysis of Various Selector Systems and the Principles Upon Which They Are Based, and The Determination of the Optimum Capacity of a Selector." Kharkevich proposed a procedure for selecting the commutation properties of a selector which is applicable to mechanical, relay, and electronic systems.

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Additional reports presented on this same subject were: (1) V. G. Terekhov, "Investigation of the Effect of Protective Circuits on the Operation of Voice-Frequency Pulse Receivers"; (2) V. A. Arapov, "Feasibility of Using Resonance Relays in Communications Installations"; and (3) A. A. Arkhangel'skaya, "Construction of Some Sub-Assemblies of a Relay Automatic Telephone Exchange With Coded Control of the Selectors." Terekhov outlined the results of a series of experiments, performed by the laboratory jointly with the TsNIIS, on the study of voice-frequency pulses; Arapov reported on the results of theoretical and experimental work on a new resonance relay design which should find wide application in automation of telephone communications; Arkhangel'skaya spoke on the development of relay automatic telephone exchanges making use of a principle worked out in the laboratory (triple group formation and coded control of the selectors).

Problems related to the theory of propagation of electromagnetic energy along communications lines and to the theory of analysis of electrical circuits were discussed at other sessions of the seminar. The following reports were submitted at these sessions: M. L. Levin, "Propagation of Waves in Non-homogeneous Lines (Lines of Varying Cross-Section)" and "Obtaining the Telegraph Equations from Maxwell's Equations for a Line with $\epsilon = \epsilon(x, y)$ and $\mu = \mu(x, y)$ "; V. A. Taft, "Four-Terminal Networks With Chebyshev Parameters for Correcting Amplitude-Frequency Characteristics"; and R. Yu. Gints, (TsNIIS) "A Geometric Method of Investigating Multi-Terminal Networks and Its Use For Electrical Analysis of Decoupling Devices."

N. A. Brazma reported on work conducted in the Latvian University on the solution of systems of generalized telegraph equations. This work was done in cooperation with the laboratory.

K. Ye. Kul'batskiy submitted a report on "The Historical Development of Long-Distance Telephone Communications Engineering in the USSR."

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